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INTO
THE CAUSES OF PREMATURE
DECAY,
IN OUR
WOODEN BULWARKS,
WITH
An Examination
OF THE
MEANS, BEST CALCULATED
TO PROLONG THEIR
DURATION.

By RICHARD PERING, Esq.
OF HIS MAJESTY'S YARD
AT PLYMOUTH-DOCK.

"HAUD INEXPERTUS FACTA DOCEO."

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TO THE READER.

IN calling the public attention to subjects of so much vital importance as those treated of, in the following pages, the author has little to *fear* from misconstruction. The envious, no doubt, will scrutinize his suggestions, with every possible severity, and make a point of decrying the measures he proposes—because they did not originate with themselves: but it is to the candid only that the writer appeals, to those, who have the interests of England at heart, and he can feel no hesitation in laying his observations before their impartial tribunal, since his sole motive for doing so, is the good of his country.

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perience, during this long period, he trusts that his claim to pass an opinion on the subjects hereafter adverted to, (subjects which he has had unusual opportunities of studying, and which have employed, as well as delighted, most of his leisure hours,) will not be disputed. After long and mature consideration, he is imbued with a thorough conviction that many and most essential improvements *may* be adopted, not only in the models of our ships, but, what is of infinitely more importance, in their preservation. Under this impression the writer feels that he would not act consistently with his duty, as an officer of his Majesty, or with his feelings, as an Englishman, if he were to hesitate in impressing upon the public mind, that a speedy investigation of the means, whereby the duration of the British navy may be protracted to its longest term, is a public duty, and that on the prompt performance of it depends our final salvation in the mighty conflict, in which we are engaged. By the present mode of ship-building, that noble structure, a first-rate man of war, becomes useless, from premature decay, in *five* or *six* years, and the average duration of the navy itself may be said to be limited to *eight* years,—a short-lived existence, indeed, when we reflect on the immense expense and importance of our fleets. This is no light assertion, (as incontestibly witness, in the former respect, the Bulwark, Foudroyant, Ocean, and Queen Charlotte), and it completely oversets the general idea, that ships built in the King's yards are better and more durable than those built in private ones, except for workmanship.

There are many reasons why the decay of our ships is, and always has been, so active in its progress: but the chief ones to be assigned are, improper methods of building;

caulking, fastening, &c. The cost of a three-decked ship, in her hull alone, is nearly £100,000: but this sum, great as it is, is nothing in comparison with the want of timber, which a perseverance in these improper methods must, eventually, create; and it is, by no means, anomalous to assert, that the nation must, in a few years, be rendered incapable of supplying timber for its use from her own bosom, unless some steps are, immediately, taken to husband, by economical arrangements, such timber as we now have, and to provide stores for the navy's future necessities.* Thus the expenditure of money is nothing, when contrasted with the great consumption of materials and the probable scarcity, which the untimely wasting of our ships must occasion. It is true that we collect much of our timber from other countries: but this only renders the business the worse; for, however paradoxical it may appear, it is a fact, that the more timber we borrow from our neighbours, the greater injury our navy derives, as, in proportion to the quantity of foreign timber imported for building our ships, decay has the greater opportunity of increasing the celerity of its steps, because foreign timber is uncommonly susceptible of rot;—the writer alludes principally to that species of oak which has been imported of late; and considers it

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* A 74-gun ship swallows up, nearly, or full 3,000 loads of oak timber. A load of timber is 50 cubical feet; a ton is 40 feet; consequently a 74-gun ship takes 2,000 large well-grown timber trees, that is, trees of nearly two tons each. The distance recommended for planting trees, between which underwood is meant to grow, is 30 feet. Supposing them to stand at two rods (33 feet) apart, each statute acre would contain 40 trees; according to this calculation the building of a 74-gun ship clears the timber of 50 acres. How incumbent, then, is it on every landholder to become a planter! Whatever people may think, the time

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is coming, when a much larger consumption of timber than heretofore must take place, and when the navy, great as it is, must be rendered still greater: for, as our enemies increase their navies, we must, proportionably, increase ours, and this increase, the writer has no doubt, must be taken at a greater ratio for the time to come, than it has been in time past, if ships are built as at present.

necessary to mention that oak may be procured from some parts of America, of a far superior quality to that spoken of, and nearly, if not quite, equal in goodness to our own.

The immense quantities of foreign timber introduced into our dock-yards, are, undoubtedly, one great cause of the rapid decay sustained by our ships. As to the necessity of this substitute, the writer does not pretend to dispute: he is only sorry to see that, by the apparent want of English timber, this succedaneum (the present cost of which is about thirteen pounds per load, though from its early and rapid decay it eventually costs double that sum) *must* be resorted to. If English timber is *really* so scarce, that sufficient quantities of it cannot be obtained to supply our wants, the writer would submit that whatever foreign timber is used, should be used by itself, as much as possible, and not be intermixed with English oak, if it can be avoided, and for this evident reason—the existence of this sort of American oak never exceeds *four* or *five* years; owing to the operation of the dry rot: consequently whatever wood comes in contact with it, must immediately take the infection, and when once the infection has taken place, it is an impossible task, the writer will, positively, assert, to put a stop to it.

It has been argued, that no such thing as a maximum should be imposed on any one article, in any country, and that, by leaving matters alone, things will find their level. All this may be very true: but, with respect to timber, great doubts may be entertained whether it ever will find its level, (except on its native ground) since no man can afford to plant oak, who is not a man of fortune, and, as he sows his acorns, more frequently for the purposes of decoration than for those of profit, the price of timber will, naturally, augment. Much timber has, undoubtedly, been planted: but whether it be enough to keep pace with the consumption made by our navy, remains to be proved. Still it is a laudable ambition that urges noblemen and gentlemen, possessed of extensive domains, to take some pains in embellishing the country; and so extensively has this ambition diffused itself, throughout the kingdom, (the writer has been informed, by good authority) that more oaks are growing in it, at the present moment, than there were fifty years ago: they are young, certainly, and principally intended for ornament, but it would be paying our great landed proprietors a bad compliment, indeed, to imagine that, in a case of necessity, they would not be ready, even anxious, to divest their parks of their verdant honours, for the support of the navy. Had government forests sufficient to find the navy in oak, it would prove an ultimate saving of millions, and the day, perhaps, will come, when our descendants will have great cause to find fault* with the present age, for not taking the necessary steps to ensure a constant supply of oak for this purpose. If it be allowed, now, that our own oak is scarce, and that the quantity newly planted can afford us no immediate assistance, it becomes an absolute duty to have recourse to such means, as may not break in too largely upon our native stock; and if, on the other hand, a sufficient quantity of our own oak is to be procured, what reason can there be for making use of *such* foreign oak as has, of late, been imported? In whatever way the question is considered, it is evident that no good can arise from a preference being given to foreign oak, as, from its speedy decay, it effects no eventual saving whatever of our own, to which, and which only, it will be found that recourse must be had at last. Putting the present, then, entirely out of the question, we must provide for the future, and if we do this, without delay, (in the mean while, husbanding our own resources,) in fifty years the importation of oak from foreign climes will be as unprofitable a speculation as that of sending coals to Newcastle.*

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* There are several public spirited persons in our different counties, who are entitled to the praise of posterity for their exertions in planting, and particularly J. P. Bastard, Esq. M. P. for this county.

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* There are certain trees which grow spontaneously; but oaks will not do this, at least they will not thrive, and must be fenced round and taken great care of, in their infancy. Elm will grow without the aid of art, and nearly supply itself, because its consumption is less than that of oak: but elm is only fit for certain purposes, and of comparatively short duration. Our forefathers, certainly, understood the nature of timber very well, or they would not have employed the most durable woods, oak and chesnut, in the construction of buildings intended to stand for many ages. The most ancient edifices, we have in the kingdom, are built, as far as the wood work goes, with Spanish chesnut, a wood by far more durable than oak; for in some of

Another great cause of decay in our shipping is the mode of fastening, by *treenails*,† a mode which is so objectionable, in every respect, that the writer will defy all the shipwrights in the kingdom, or the art of man, to invent a *worse* instrument, for confining the planks of a ship to her

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these edifices, in which pieces of oak were used, it has been found necessary to remove them, in consequence of their being entirely decayed, while the chesnut continues sound to the present hour. There is no doubt, if chesnut is kept dry, that it will last for a thousand years, while it has been ascertained that oak does not last more than half the time. The writer wishes that he could see more chesnut planted than there is. It is a commonly received opinion, that the chesnut was, originally, brought into this country from Spain: but there are many reasons for supposing that it is indigenous to our island. This opinion must have arisen from the nuts being imported in great quantities from Spain, and from their being much superior in quality to our own, which proceeds entirely from the superior warmth of the Spanish climate: but great doubt is felt by the writer, if the Spanish chesnut, cut down in Spain, would be found so durable as the chesnut felled in England, because the growth of our chesnut is much slower than that of Spain, unless on the high lands in the latter country.

† A treenail is a piece of cleft wood, (made round) from one foot to three feet six inches in length, and an inch and half in diameter.

side, notwithstanding it is now, and ever has been, the uniform practice of this country. This is a bold asseveration: but the writer is ready to maintain the fact, and the reasons he can urge in its support are many and conclusive. In the first place, a treenail, being rather less in the middle than at the ends, and always made so by the workmen in order that it may drive easy, never fills the hole it is driven into: consequently, if ever it admits water at the outer end, which, from shrinking, it is liable to do, that water, immediately, gets into the middle of the plank, if not further, as a treenail is always porous from end to end, and thereby forms a natural vehicle for the conveyance of water. In proof of this, take a treenail three feet in length, wet one end of it, and blow in at the other, the tubes, immediately, convey the air from one end to the other, and the water at the opposite end will be seen to rise in bubbles. Another great objection to the treenail is, that it is the second thing which decays in a ship, the first, generally, being the oakum; should any part of the plank or timbers of a ship be in an incipient state of decay, and a treenail come in contact with it, the decay, immediately, increases, while every treenail shares the same fate, and the natural consequence is, that the ship is soon left without a fastening. How many ships have gone to the bottom, and how many thousands of lives have been lost, from this mode of fastening! A ship floating in still water does not feel the use of a strong fastening, because the natural compressure of the water on the outside, has a powerful tendency to keep the plank on; but when a ship begins to labour in a heavy sea, then, if her fastenings are not good, she must founder. And yet how common a thing is it to hear a sailor say, that a vessel must have sprung a *butt*, and foundered,—a circumstance that could not have happened, if her fastenings had been good ![*]

Another very great objection to a treenail is, that, if the plank be not laid close to the timbers, the passage of air alone, in the interval between them, will cut the treenail in two. The writer has even seen copper bolts eaten in the one-eighth of an inch, by a current of air between the plank and the timbers, and iron, totally, destroyed. Another objection arises from the large wound which the timbers receive, when they are bored for the reception of the treenails. Another objection is, that they are, frequently, upset and rendered useless, by injudicious caulking, and, as frequently, broken off short, by the injudicious set of the caulker's reaming irons. Another is, that the plank on the side, which forms a principal part of the strength of a ship, is wounded very considerably by the inch and half augur. Another great objection, and the greatest of all, is, that treenails shrink, in a warm country, and admit water, in which state, not only the timbers separate from the plank, and the plank from the timbers, inside and out, but the treenails disengage themselves from both. After a ship has been abroad for any time, it is highly dangerous to send her home, without a minute inspection, for, should she be in a state of decay, her treenails, which ought to be the strongest, since they are her only fastenings, are the weakest and the worst part belonging to her. The consequence of that ship's experiencing a gale of wind must be, that she goes to the bottom. Another objection to a treenail is, that it never draws its work home, but, on the contrary, drives off the inner plank; and when once it has shrunk, so as to become slack, in the least degree, (which must, inevitably, be the case in a warm climate,) it becomes almost useless. Having said thus much on the treenail, the writer would be glad to know if any thing can be alleged in its favour,—he believes not, and, therefore, must repeat what he has, before, observed, that it is impossible for all the shipwrights in the kingdom combined, or the art of man, to invent a *worse* instrument, for confining the planks of a ship to her side, than a treenail; independent of the great consumption of oak timber in making it, which must be of the best quality, and, therefore, is very expensive.

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[*] The writer cannot allege a stronger proof, on this head than by calling the attention of his readers to Lloyd's list of merchant-ships that have foundered within the last twenty years: they will therein find that as many subjects of Great Britain, valuable sailors, have been lost to their country, as would have *nearly colonized* New South Wales, nine tenths of whom, the writer, verily, believes, would have been saved, had copper fastenings been made use of in the vessels in which they were lost, instead of wood. Is it not then the business of the legislature to interfere and substitute that which will prevent the loss of so many valuable subjects? Parliament, very humanely, voted a sum for carrying into effect the plan proposed by Captain Manby, for saving the lives of shipwrecked sailors,—a plan, to the propriety of which every man living must subscribe; but where one sailor can be saved by Captain Manby's plan, a thousand will be rescued by the general use of copper bolts instead of treenails!

It becomes his duty, now, to point out a substitute for the treenail, that shall be totally free from the defects complained of, and this substitute presents itself in copper bolts; the advantages of which, if duly appreciated, would, speedily, supersede the use of this destructive and *ineffectual* instrument. Iron, also, might be employed above the bottom: but, as this creates decay, in all wood that comes in contact with it, copper bolts, about seven-eighths of an inch in size, are entitled to the preference, in every respect. In the first place, every plank and timber would be wounded in a much less degree (the treenail being an inch and half) in the proportion, as the bolt is smaller than the treenail. In the next place, the fastening would not only be *ten times* as strong, but

Iron rots wo

what is still more worthy of notice and not sufficiently to be prized, it would *never* decay. Another great advantage to be gained would be, that the timbers of a ship might be sided much less throughout, which would make a considerable saving in the conversion of the frame, and most amply compensate for the additional expense of copper. The timbers, moreover, in consequence of a greater circulation of air being diffused between them, would keep dryer—a circumstance, now, most materially wanted, and which would highly conduce to their preservation. The mind also of the sailor might be more at rest, when crossing the Atlantic Ocean, in a crazy bark, from feeling satisfied that the fastenings of his ship are good, though her timbers are rotten.

The bolts of the knees and hooks, and the nails of the decks should be all copper, by the use of which, the whole, and particularly the decks, would last as long again. The prejudiced may here exclaim (for they have no arguments to bring forward) that the cheapness of the treenail and iron should, necessarily, give them a preference over a metal so scarce and costly as copper: but to this remark the writer cannot assent. Will the use of copper create no saving, by prolonging the duration of a ship, and are men's lives of such little value to Great Britain, that a destructive practice must be persevered in, because it is, falsely, considered the cheapest? The writer, therefore, until he is convinced to the contrary, will continue to maintain his opinion, that copper is the *only* fastening which should be used for keeping a ship together, and that the *worst* in the world is the treenail. If copper sufficient is not to be obtained in this country, we can have as much as we please from South America: but there are strong grounds for supposing that there is plenty of copper in the kingdom, particularly as it is now low in price.

Another cause of decay in our shipping is, the mode of caulking their seams. In general, when a vessel undergoes this operation, the caulking is begun on her top-side, and continued downwards. If a seam should not be left wide enough by the shipwrights, the reaming irons of the caulker must make it so, by driving wood into wood, for a certain quantity of oakum, (viz. two threads to an inch thick of plank) is directed to be driven into each seam, whether the same be wide or narrow; the result of which process is, that, in caulking downwards, the whole strain of the preceding streak lies on the treenails of the next. Can any one wonder, that, under these circumstances, the treenails should upset, or that the planks, instead of adhering, should fly from their work? The writer has seen a ship caulked down with such narrow seams, that, in order to make them wide enough, the reaming irons have so distressed the plank, as to force the lower edges of many planks following, one-half an inch off the timbers, which half an inch has been dubbed off, for the purpose of making the bottom even, to receive the copper-sheathing: in this state ships frequently have gone to sea!! For the prevention of this great evil, all ships should be caulked, according to the following plan. In the first instance, half-caulk the seams for four or five streaks, then finish the first seam, then half caulk the sixth streak, then finish the second seam, and so on, until the caulking is finished. By this simple process a very strong barrier would be formed against the mischief, now done by the caulking irons to the fastenings, in consequence of their strain being thrown on three seams instead of one: one course of staging, moreover, as at present, would suffice for the purpose.

The common method of fastening knees, beams, &c. is by driving bolts, which, after they have been driven, are clenched on the in or outside, (according to circumstances) by nothing more than a ring put over the end of the bolt, which is battered over it. Now, let the writer ask, what degree of pressure three pieces of wood confined together in this manner, bear to each other, and if they bear any, how long the bearing will last? The question, which is a most material one, may be answered thus: they never can combine together, as they ought to do, and for this reason—while the bolt is fastening the first piece to the centre one, the third is driven off its work. But supposing this not to be the case, and that the three pieces could be, effectually, bolted together and clenched up, they would not continue close for one week, particularly if composed of green wood, because every piece will, naturally, shrink, and consequently, all bolts, fastened as they now are, in ships, by no means afford the security they ought to do—indeed the writer has frequently seen the clenches of bolts protruding a quarter of an inch beyond the wood—a fact, which no shipwright in the kingdom can deny. Is it, then, at all to be wondered at, that ships should get loose, and work on their fastenings, when it is known by every body that all wood will shrink? Let a coachmaker build a coach, and fasten it together in the same way as a shipwright fastens a ship, by driving in bolts, and then clenching them on the wood,—how long will that coach run over the stones in London, or on the turnpike-road? But he resorts to a different mode, which is the *strongest* in the world, that of compressing wood into wood by means of *a screw*, instead of a clench; by this all racking is done away, for a certain time, till the wood shrinks, on the observation of which the carriage is driven again to the coachmaker's, and the fastenings are hove up. Now, let any man in the world, whether he be a mechanic or not, decide which is the best mode of fastening —a clench or a screw: but the thing is so very obvious, as to speak for itself. No bolt was ever yet driven into a ship, that performed the office it was meant to do. In the first place, wood is never compressed to wood by a clench; in the next, wherever the wood shrinks so much play is left for the bolt, for which there is no remedy; though when wood is compressed together, its strength is increased tenfold. In evidence of this, let the reader suppose the pieces forming a mast to be fastened by bolts, and the hoops left off,—and then ask himself how long it would stand? It is the compressure alone that gives it strength.

The writer does not mean to say that it is, absolutely, necessary for every bolt to have a nut and a screw on the end of it: bolts, subject to a lateral strain, only, may be permitted to remain fastened with a clench; but, if all bolts were to be fastened with nuts and screws, it would be much better workmanship, and they might be much easier removed, when wanted to be driven out. A ship kept together, as is now the case, by clenched bolts, the writer will venture to affirm, is not half so strong as she would be, if nuts and screws were substituted in the stead of clenches, on the points. The clench of a bolt is but a single thread, while that of a screw forms three or four threads: on this principle, alone, it is so much the stronger; and as copper is a better fastening than iron, a nut and screw on the end of a copper bolt would render the holding complete. How admirable would this be in a mortar-vessel, where the fastenings are so severely tried by every explosion!

After a new ship has been at sea some time, it must be obvious to every comprehension, that the wood will shrink, in some degree, and that this shrinking will be proportioned to the greenness of the wood. Agreeably to this proportion, will be the interval between the parts of the ship that were, at first, in contact with each other: consequently, when the fastenings obtain space to play, so much room is given to the ship to rack, and her condition, every day, gets worse and worse. In this state there is no remedy, except that of cutting off every clench in the ship, and hardening up the bolts—an Herculean task, which has never been, and, perhaps, never will be, attempted.

Another great evil is, when a ship, having been taken into dock and undergone a partial repair, goes out again with part of her bolts driven in a-new; while the others remain, (as they were when the ship came in) worked slack by her racking, and the shrinking of the wood. The consequence of this is, that the new bolts have to bear the heaviest part of the strain, and continue to do so, till they are worked as slack as those that were driven into the ship, when she was first built: is there any cause, therefore, for surprize that such a ship, when at sea, should *complain* in her water-ways and bows—which, by the bye, is, universally, the case with the ships in our navy? But a copper nut on the end of every bolt might, at any time, be hove up, so as to make wood and wood bear together, as it ought to do; for the nut will never so fasten itself by rust on the end of the copper bolt, as not to admit of its being hove up for years after. It is, absolutely, impossible to prevent ships from leaking in their decks, according to the mode in which they are now fastened, and for the following reasons: in the first place, no ship was ever fastened tight, nor is it possible to be done, by a clench on the end of a bolt; nothing but a screw can do it—the wood may, then, be hove together till there is no play, and should it ever shrink, by the ship's going into a warm climate, or by her being exposed to the intense heat of the sun, at home, during a warm summer, the nut on the end of the bolt, may be hove up accordingly. In the second place, by the working of the ship, copper bolts, as they are now fastened, are very apt to work loose; and it not unfrequently happens, in unbolting the riders in the hold, that copper bolts, as soon as the clenches are knocked off, drop, by the first blow, into the dock.

The power of the screw on the end of the bolt is such, that were the opposite end of the bolt one quarter of an inch larger than the bolt itself, the screw would heave it through the solid wood. Some of the longest and largest bolts in a ship are those driven into the knee of the head, being in diameter, generally, two inches and 5-8ths, and in length twenty-two feet or more. These bolts are driven by a heavy weight, acting against them, like a battering ram, with a force proportioned to their size, and being impelled from the outside, pass through the knee of the head, the stem, the apron of the stem, and the breast-hook within. By this mode the apron and the breast-hook would be driven off their work, if it were not prevented by a shore against the breast-hook. When the bolts are driven up to their heads they are clenched on the inside, sometimes on the breast-hook, and the operation of fastening is *supposed* to be finished: but this is a false supposition—for the writer will venture to affirm, that it is impossible for these bolts to hold all things together, so tightly, as they ought to do, even for one week! Will any one attempt to argue that two and twenty feet of wood, driven through in the lateral way of the grain, will not shrink? Every one must allow that it will shrink: as a matter of course, then, it shrinks from its fastening, namely, the clench; and it was not long since, that the writer pointed out to the overseer of a ship on the stocks, that in every bolt on the scaph of her keel, the wood had shrunk *one-quarter of an inch* from the clench. If the least play, whatever, occurs, where there is any fastening, water will get in; particularly in the forepart of a ship, when she is riding with her bows to wind, and in a heavy sea. Is there a seaman in the British navy, who will hesitate to say, that the bows of his ship are almost always leaky? And this will ever be the case, until the present practice is abandoned, and the plan proposed by the writer, of cutting a *screw* on the end of the bolt, and *heaving the work home by a* *nut,* is adopted: this is the only way, in which solid work can be made in shipbuilding.

Having said thus much on the modes of fastening, the writer will now endeavour to anticipate and examine the objections that may, unthinkingly, be alleged against his plan. These objections will, most probably, comprise the difficulty of cutting the screw, and the time it might take to do it. These objections have no basis, and whoever urges them, will employ himself in an useless labour; for the nut may be cast *in a mould,* with the thread complete; and the screw on the point of the bolt may be cut *in an engine,* easily to be made for the purpose. With respect to the length of time employed in cutting the screw, the writer has no hesitation in saying, that it can be done *sooner* than battering the clench.

Another cause of decay in our shipping is the insinuation of moisture between the openings in the water-ways, from the working of the ship, which then proceeds downwards between the timbers, where no circulation of air can come; *fungi*[*], immediately,

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[*] Suffocated damps, are the principal occasion of *fungi* or mushrooms, innumerable species of which, have been discovered by naturalists, in every country. The one created by damp in timber, is the sort to be here spoken of. Although in species the same as mushrooms, it is in quality, very different; for the writer has known it to grow so strongly betwixt the timbers in a man of war, as to force a plank from the ship's side *half an inch.* In a strong heat *fungi* will not vegetate; they only thrive where a degree of quickening is given, similar to that afforded by lime to the field that is dressed; *fervent* heat will destroy them; drought will destroy them; lime, wherever it can be applied, dissipates them instantly, as will any poisonous substance, such as mundic, or other things that destroy vegetation: but damps, immediately, generate them. After a ship, however, is put together, the application of lime or mundic, or any thing else, of a similar nature, is out of the question, (except she be taken to pieces) since nothing can do good in this destructive disease, while she remains whole, but the diffusion of as much heat, by the means of stoves, throughout the ship, as can be excited without setting her on fire.

With respect to the dry-rot, its origin, may be abscribed also to damps, though it must be understood, that fungus form, and extend their deadly ramifications, in every direction; and the dry rot, at the same time, makes its silent encroachments, until the timbers are reduced to powder. In considering this part of the subject, it may be, *truly*, said, that nothing is more

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and dry-rot are not *one* and the same thing; for the latter does not require *one-half* of the moisture to keep it in a state of activity, that fungus does, and so extensive is its power in spreading contagion, whether in buildings or in ships, that, by taking a small portion of dry-rot and scattering it in a confined spot, between the wood work, the timbers, instantly, contract the complaint, and get into as bad a state as the building or ship, from whence the rot was taken. But—there is still another remark to be made; fungus and dry-rot being both poisonous in their nature, occasion deleterious vapours in a ship, and, therefore, must render her very unhealthy. We must know this, from the ill effects attendant on our residing in a damp house. Nothing will totally free a ship from the dry-rot, when once it has taken root; it may, for a while, be, partially, suspended by fire or heat: but it cannot be extirpated, unless the ship is taken to pieces, and the infected timber is removed. Drip or damp, the writer repeats, is the only cause that creates it, and this never can be prevented, while our ships are built as they now are. Foreign timber is, generally, much more susceptible of the dry-rot than timber of English growth, (though grown in the same latitude as that of America) a circumstance arising, perhaps, from the nature of the soil in which it grows.

destructive to wood work, than *partial* leaks, for if it be kept *always* wet, or *always* dry, its duration, in either case, is of long continuance.

After a ship has stood a twelvemonth or a little more, in her frame, to season, her beams are crossed, and she is completely planked from her wales upwards; the upper deck is then laid and caulked in, and the top side is caulked also, in order to prevent moisture from insinuating itself between the timbers: in this state, ***it is taken for granted,*** that she must keep dry—how dreadful is this mistake! At the period when the important operation of caulking in is performed, it too often happens that some of the timbers are, partially, affected, others are, completely, saturated, with wet, proceeding from their greater or lesser exposure to the elements, while the frame was building, or from the evaporation in the planks taken from the kiln, in which they are boiled, according to their thickness, one inch to an hour. The quantity of water they imbibe, is, in proportion to a cubic foot, at least one pound weight, or a pint: its dispersion, under these circumstances, from the pores of the wood, is, at all times, slow and tedious, and particularly during the winter months. Thus, the very thing which is intended to prevent the formation of fungus and dry rot, unavoidably create them! In some dock-yards, salt water is used in the boilers, in others fresh ; not from any idea that one is more fit for the purpose than the other, but from considerations of convenience: but the fact is, plank boiled in salt water never gets rid of the salts that, naturally, enter the pores of the wood in boiling; and such being the case, the ship in which this plank is used, is much more liable to the effects of damp than she would have been, if the plank had been boiled in fresh water. All those who doubt this, are desired to look at buildings in which mortar has been mixed with sea sand: *the art of man* cannot make such buildings dry.

Should any one be so thoughtless as to suppose, that the caulking of a ship's side, so soon after planking, will prevent it from leaking? And yet, if he did not think so, he would not caulk it. Would he but reflect, for one moment, ere he closes up the deadly seeds of decay in their congenial soil, he would feel convinced that the plank must immediately shrink from the oakum, and owing to the concavity of the side, must admit a considerable quantity of moisture between it and the oakum, the latter of which will act as a spunge—indeed, much more moisture gets in, than could find an entrance, if the side were perpendicular, and therefore, the greater caution is required in caulking. In proof of this, the writer, not long since, observed a ninety-eight-gun ship, on her slip, with her top sides, after caulking, all shrunk from the oakum, in such a manner, that a thin chip might have been laid between the oakum and the plank, fore and aft the ship: it is necessary to mention that, on a representation of the circumstance, the ship was re-caulked. Can any one wonder, after all these operations from *without* and from *within*, that fungus and dry-rot should unite together, to doom our ships to a mouldering destruction? If a ship, while building, were to be, *wholly*, soddened with water, fungus would not form, or if she were to be kept, *perfectly*, dry, it would not form: but it is *partial leaks*, *suffocated damps*, and *oozing drip*, where there is no circulation of air to dry the timbers, that produce it. It may be asked, why do our ships decay faster now, than they, formerly, used to do? To this, it may be answered, that the materials for building our ships were, *formerly*, collected and seasoned for use, a considerable time before they might be wanted: but, even when our ships did last longer, they still decayed much sooner than they ought to have done, by several years. The writer has known ships stand so long in their frames, exposed to the open air, that many of their timbers were completely decayed, before a plank was put on: in short, no ships, built in the way they now are, can, generally speaking, last for any thing like the time they would do, if built as herein pointed out.

The Royal William has enjoyed a longer duration, perhaps, than any ship in his Majesty's navy; by what physical cause an extraordinary duration has happened to this particular ship, the writer has not the means of ascertaining: but that our ships become useless, in the course of four or five years, without great repairs, equal, almost, to their first cost, and that the average existence of the British shipping does not exceed the short space of eight or nine years, is a fact, which he, unfortunately, knows too well. The melancholy spectacle is now to be seen in one of our yards, of a three-decked ship, *only a twelvemonth old*, in a state of entire decay.

When the writer looks round, and observes the magnificent undertakings and projections, that have, of late, been brought forward in this country, such, as for instances, the wet docks of London, the three additional bridges across the Thames, the inclosure of Plymouth Sound, and, he may add, the dock at North Fleet (which latter, however, he hopes never to see undertaken) he cannot refrain from admiration. It must be allowed, that the people of England, begin to view things on a much more extended scale than they did formerly, and as riches, which are daily accumulating, increase in this nation, grand and elegant designs will be the natural result. Why it has not, heretofore, paid greater attention to the formation and establishment of great national works, may have proceeded from an unwillingness, in the country, to divert any part of its capital, from the channel of commerce, while that channel was open to the spirit of adventure: but there are particular eras of improvement in every nation, and it is very reasonable to suppose, if England can but maintain the glorious height she now occupies, for some time longer, that money will soon be the *least* of her necessities. Such times are favorable to superb and useful undertakings, and if the country be but true to herself, these times may be, confidently, anticipated, if they have not, already, arrived.

In all works carried on by a body of merchants, such as the London docks, &c. the ultimate object in view is convenience, and the present, or acting stimulus, is profit; and, in general, it is Government, only, that can undertake works, in which convenience, rather than profit, is to be considered: but, if the writer can point out to Government a plan, the result of which would produce profit, as well as convenience, he will not do Government the injustice to suppose that it would hesitate, for a moment, in carrying such a plan into immediate execution.

As our past object has been to establish a naval preponderance, the present aim, should be to preserve it unimpaired, and we cannot do this more effectually than by taking such steps as may ensure the existence of our ships for five and twenty years, nay more, if possible, instead of eight. In order to effect this, it would be necessary, besides what has been, already, recommended, to build all our ships *under cover*, which might be done with the greatest ease. Why this practice should not be adopted, with respect to ships as well as boats, the writer is at a loss to understand: but it is not yet too late to obey the dictates of common sense. A ship built under cover is better, in the proportion of three to one, than the one framed in the open air—indeed, it may be asserted, that the advantages to arise from building all our ships under cover, are incalculable, and the expense of doing it would be a mere trifle, compared with its great utility, convenience, and profit. Besides—shall it be said that millions are to be expended, in making a safe roadstead for the reception of our ships, while the ships themselves are suffered to contract rot, and go to decay, through improper management in building them?—Surely the next object to that of modelling a man of war, in a proper manner, is to render her as lasting, as the perishable nature of her component parts will permit.

It ought, also, to be well understood, by every one in this country, that *another* thing is required, and it is an essential one, to bestow a longer existence on our ships, and this is, to have the timber well seasoned before it is used in a ship, and that ship is permitted to go into the water. Ships, it must be well known, are now allowed to stand in their frames, for two years or upwards, to season, before the plank is laid on, or their finishing is completed. The writer has known instances, in which ships have stood from ten to fourteen years in their frames—a most unreasonable period, as was plainly proved, by the decay of many of their timbers, and by the necessity of substituting others in their place, before the ship could be gone on with; and the impropriety of this delay, cannot be stronger exemplified than in a ninety-gun ship, now under repair, the whole stern frame of which is decayed, from standing too long exposed, though she has not been launched more than five years. A ship standing exposed in her frame to the influence of all sorts of weather, is not dry, on an average, for one half of the year: indeed some parts of her scarcely dry at all, which parts are in the lower part of the cantbody forward, in the lower part of the cantbody aft; round her bows, between her knight-heads and the stern, and in the joining of the transoms and the fashion-pieces abaft, in fact in all those parts where the timbers come close, and are in contact one with the other. What are the effects of this exposure, particularly in the places before enumerated? The result is, that, after a ship has been planked up and all is close, these places first begin to get into a state of decay, arising from partial wet, both in winter and summer, and from the snow's lying, some times, for a considerable time, on the frame: by these means, damp is enabled to form the seeds of future destruction, which do not burst into active growth, till a genial and quickening degree of closeness is created, by the laying on of the planks and the application of the caulking irons. The writer has seen a ship planked over, when her frame was *as green as grass*; and there is not even a solitary instance, within his recollection or knowledge, of any ship being planked over, whose frame was entirely free from this greenness. It is true, that the outside is dubbed over, and so is the inside, after a vessel has stood to season: but the moulding, or lateral part of her frame, is never touched, after it is once set up, nor is it possible to be got at, *even if it were* thought necessary, or desired, without taking the frame to pieces. If a ship, therefore, is at all damp, after being finished, this dampness, which is, chiefly,* occasioned by her frame being exposed to our variable weather, never ceases to prosecute its ravages, until it has reduced the noble fabric to its mother earth.

The writer has heard it remarked by many (who certainly proved by the remark how little they had considered the subject) that the decay among our shipping is entirely *accidental,* and not to be accounted for, on any principles: the writer can by no means assent to this opinion, for he has, he believes, satisfactorily, though painfully, proved, that the decay is *not* accidental, but that the same is *caused* by the *use* of *unfit* materials, and *improper* methods of building, caulking, fastening, &c.

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* Another cause of internal damps arises from permitting timber to lie in uncovered piles, exposed to the attacks of all sorts of weather. By this highly improper, though common practice, the interiors of the piles are kept in a state of partial moisture, for the formation of *fungi* and dry rot; and with respect to their exteriors, the same objection is applicable to them as to the frame of a ship. That timber may be seasoned prior to its being used, by other modes than those recommended, there can be no doubt: but still, whether these modes be advisable or not, the *propriety* of sheltering the piles, and building our ships under cover, cannot be impeached.

Were all ships to be made equally firm in their construction, and of timber grown in the same soil, they would last equally long. As has been before observed, it is *partial leaks, suffocated damps,* and *oozing drip,* added to the variation in materials and workmanship, and to the difference of the times or seasons, in which they are planked up and caulked, that affect one ship more than another, and confer a greater or a lesser degree of durability. In evidence of this let two ships be placed side by side on the stocks, and let both be built with exactly similar materials from one forest; let one of these be planked and caulked in the month of August, and the other in the month of January: if the summer be dry, the former will possess three times more durability than the latter. Can it be said, after this, that the decay of ships is purely accidental? All ships built, and caulked in, quickly, will most undoubtedly have created within themselves a certain degree of fermentation, amply sufficient to promote and encourage a quickening of fungus or dry rot. If a large quantity of chips be thrown together in a heap, they will, in a very few days, become quite hot, and ferment like horse dung: let this remark be applied to a ship, and we must confess, that greater causes will occasion greater effects.

Can it, therefore, on mature reflection, be doubted, for a moment, that extraordinary advantages must result from ships being built in the dry? The writer verily believes that a ship built in the dry, would season more in one year than in five, by a contrary mode, as *fungi* would have no opportunity to form, and should any have formed on the timbers before they were used, and not have been destroyed by the vessel's being built in the dry, they would soon die for want of moisture. Nothing can be more fallacious than the mode which is now practised of seasoning our ships. The frame is but one part of a ship, and no one will say a plank, ten inches thick, laid on her outside, and another nearly as thick within, are trifling pieces of timber. Do these planks require no seasoning? By the mode in which ships are now built the writer is bold enough to say, that it is impossible for more than a very partial seasoning to take place. The plank is brought to, both seasoned and green, but chiefly the latter, for it seldom happens, that *seasoned* plank is to be had; and supposing even that it were to be procured, in sufficient quantity, the preparation of boiling it so many hours in water, in order to make it bend to the ship's side, saturates it so much with moisture, that a long time necessarily elapses before the middle gets, properly, dry; and too often, long before it is possible for the plank to become, perfectly, dry, it is bored off, fastened, and caulked. What else can be expected, than that the plank should shrink from its work, and the work from its fastenings, that the seeds of destruction should be sown in the treenails, and that the oakum should become sodden with wet, and admit through it an oozing drip, into the interior of the ship's side? The timbers in contact with the planks that have been boiled, are kept, constantly, damp, as long as any moisture remains within them. It is this kind of damp, above all others, which fosters the fungus most, and creates immediate decay in such parts of a ship's frame as have collected a green vegetable thereon, from standing exposed, or have come in contact with any sap that had not been taken off. Surely, after a little consideration, when real facts are thus plainly told, there needs no conjuration to discern wherein the principal cause lies of the early decay of our shipping. But, if a ship were built in the dry, nothing of this kind could happen, even though her timbers and plank should be composed entirely of green materials.

The mode the writer would, strongly, recommend is this:—convert the timbers, set the frame up, and finish the ship out of the way, without at all caring whether her materials are green or not; after the ship is finished, as to her wood-work, let her stand to season, but by no means let a caulking-iron approach her side, for two years at least, for caulking is the last thing that should be done, before she launches into the deep;—no more of her bolts should be driven, than may be sufficient to hold her together, as every aperture should be left open for the circulation of air;—no treenails should be used on any account, but the work should be fastened with copper alone, wherever it is practicable,—not with iron, the rust of which is certain destruction to all wood, particularly in salt water. The advantages of this mode would be, that the timbers, plank, bulkheads, and all other parts of the ship, would be equally and properly seasoned together; and what, perhaps, would be a greater advantage still, the caulking of the ship would be done at the only time it *ought* to be done,—that is, *just before* she is put into the water, when her plank has so shrunk, as to be likely to shrink no more. Every part of the ship would thus be as dry as possible: no fungus, no drip, no unwholesome damp, would arise to endanger the health of the ship's company; for when, the oakum is driven up, it will continue its adhesion to both edges of the plank—consequently the sides of the vessel will be both *wind-tight* and *water-tight*,—and what is more, the plank will even swell upon the oakum, and unite with it in forming one solid body.—Oakum, if the wood shrinks from it, decays immediately: otherwise it will endure for many years. The longer the ship stands on her slip, after being finished, the more seasoned she will, of course, become; when this seasoning is deemed complete, then, let the screws on the ends of the bolts be hove up, so as to bring wood and wood together, in the closest contact. This method of fastening is ten times as secure as a clench, and a degree of strength is thereby effected, which is not to be obtained by any other means. The ship, moreover, would be as tight as a drum, water-proof, and healthy throughout; which the writer again affirms she could not be, on the present plan. Fastened as vessels now are, they must, necessarily, leak, because a clench never will, nor ever can, bind wood and wood together, so as to prevent them from racking. The result is, that the water-ways admit a drip, and this drip co-operates with the foe, already busy within, in hastening the work of destruction.

*A ship built under cover has the great advantage, also, of having her workmen in the dry, who get on with their work faster than they could do, if subjected to the

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*Let it, however, be well understood, that the writer's plan of building ships will not keep them *one minute* longer on the stocks than they are, at present, or delay their being launched, when wanted for use. The ships should be first completely put together under cover, and then stand to season, in the dry, instead of being exposed to all changes of weather. Let this plan be but well considered, and the propriety of it must come home to the senses of every man.

various changes of an English atmosphere. They will be enabled, moreover, to perform their work better, in the interior of the ship, as it will not be necessary to lay the upper deck, as a shelter, and, consequently, they will always have sufficient light to work from the hold upwards. Notwithstanding all these advantages, there may be many so prejudiced as to prefer the present mode of building ships in the open air, because it has long practice to recommend it. To these the writer will do nothing more than point out the saving that is likely to accrue to the country, on the adoption of his plan, which may induce them to alter their sentiments.

One most material point to be avoided in all buildings, is *a thorough draft*, for few are aware, or have the opportunities of perceiving, what a destructive foe it is, not only to wood, but to things of a much more durable nature. To prevent the operation of this, in building our ships, as proposed, in the dry, the covering, the writer would recommend, should not be a mere temporary shed,* but a *permanent substantial* erection, the roof of which ought to be made in one span, and covered with copper;--the writer prefers copper, because it is much lighter than stone, and is not so liable to be lifted by the wind in separate parts. Such erections as these may appear to many to be most stupendous undertakings: but what are they, compared with many other great works now in hand, such as the inclosing of Plymouth Sound? For a rough estimate, let it be supposed that ten thousand pounds would complete the housing over one ship—an immense sum some persons may, unthinkingly, exclaim, for merely keeping a ship dry, during her continuance on the stocks. But—is merely keeping her dry the *sole* object in view? Is it not intended to give her a longer existence, and will she not, by the plan of the writer, last *three times* as long as she can, by the present mode? If the expenditure of ten thousand pounds, or, perhaps, less, will effect this, what friend to his country can object to its being incurred, particularly when he considers that this covering will serve for *many* ships? Therefore, taking as a standard, a first-rate man-of-war, and supposing her to cost, by the time she goes into the water, one hundred thousand pounds, the saving, on this ship alone, provided the writer's principles are well founded, would, in consequence of her greater duration, be *one hundred and ninety thousand pounds*, exclusive of interest: on looking at the subject, only in this point of view, the expense of throwing a covering over our ships, must appear a bagatelle; and the plan only wants the sanction of persons, who are able and willing to order it to be carried into execution, to demonstrate its utility, beyond all contradiction.

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* In 1785, the Royal Sovereign was launched, with a housing over her, open at both ends, and attached to the ship. Another vessel, the Argonaut, had a covering placed over her while afloat, which was also open at both ends. In both these instances the *thorough draft* was found so extremely injurious, that it became necessary to remove these temporary protections.

The writer thinks he may venture to say, that we have *eight hundred thousand ton of shipping in the British navy, and that the average price per ton for building, may be estimated at or near the sum of twenty-five pounds: but, as wood gets scarcer, the cost of buliding will, also, increase. If, therefore, by the means the writer has suggested, the ships composing the British navy can be made to last twenty-four years, instead of eight, (which is three times as

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* This is the amount of tonnage allowed by the late Lord Melville, in his pamphlet on the dock-yards—1809.

long as at present), and his calculation of price per ton for building (viz. twenty-five pounds) be a fair average, the saving to Great Britain may be computed at *two-thirds* of the expense, *both in money and timber*, now incurred. To exemplify this argument—if the amount of tonnage and the present duration of our ships, as before stated, be correct, it costs England twenty millions, every eight years, in building a navy equal to that which she now possesses, or sixty millions in twenty-four years, in renewing her navy three times: but, by adopting the plans of the writer, *forty* millions of money, besides interest, would be *kept* in the national purse, and the consumption of timber, an object of no inferior importance to the country, would be *diminished* (as far as its use extends to ship-building) *two-thirds*, or in an equal ratio with the money. Nor is this all—it is not to be doubted, indeed it may be, reasonably, hoped, if proper materials and workmanship are used in building our ships, agreeably to the modes which the writer has pointed out, that many of them might endure *many years longer* than the period he has assigned for their duration.

No ship should ever have any repair, given to her, the expenses of which may exceed one-third of her original cost; for, if every thing be taken into consideration that comprises the thorough repair of a ship, it will be found to be an extraordinary waste of the public money. No ship, the writer will, positively, assert, ever received a thorough repair, without costing more money than when she was first built, and, in some instances, half as much again. Her time of service cannot be expected to be so long after a repair as when she was first built, because no more pains or cautions are taken in making this repair, to prevent decay, than when her original frame was put together: but, if a ship be built, fastened, and seasoned, so as to run out the whole time she ought to last, (viz. twenty-four years) there will be little or no occasion for large repairs; and if there is, it will be better by far, in most cases, to set another ship on the stocks.

The writer not only proposes that all our ships should be protected by housings, while building, but that the greater part of our docks also should be covered over, particularly such docks, wherein it is required that a ship should remain any length of time. The propriety of this must be obvious to every one: ships, at all times, receive much injury by being stationary and, continually, exposed to the effects of the weather. It may not be necessary to cover all docks over, as some should be kept open for the admission of ships with their masts in: but all possible means ought to be taken with a ship, in every stage, from her being first set up in her frame, to the day she is condemned, not to permit any moisture or drip to insinuate itself between her timbers. The writer is well aware, when he says this, how impossible it is, in the dreadful gales which ships, sometimes, have to encounter at sea, to prevent the partial admission of wet: but he does not mean to argue against impossibilities,—all he intends to prescribe is, that every possible caution should be used to prevent untimely decay in our ships, and to give them as much strength and stability as are consistent with their perishable materials.

Having before given his opinion, as to the mode of fastening, the writer again says it is impossible that any ship can be made, properly, tight, without a nut and a screw on the end of every bolt. This mode of fastening speaks for itself, and it is a folly for any one to attempt to say one word to the contrary.

A very particular friend of the writer, a captain, at this time, of one of the finest frigates in the service, told him on his honour, that, during a gale of wind, in a ninety-eight-gun ship, which he then commanded, the centre of the round-house beam, passed, on the roll of the ship, six inches to leeward, and so on the reverse, when the ship went on the other tack. This ship, to the writer's knowledge, was launched only four years before: but he understands that such a circumstance is by no means an uncommon thing with weak ships. Had this ship, however, been put together in the manner he has before described, he will venture to affirm that such a circumstance could not have happened—on the contrary, she would have been as tight as a drum; and he cannot but express his surprize how she was enabled to weather the storm, and reach her port.

Let only one ship be built, by way of experiment, in the way proposed, and let her remain on the slip—the writer has no hesitation in saying, that she would be sound, at the end of two hundred years; indeed, that she would last as long as the oak in any of our ancient buildings, which have been kept dry. But, contrast this with the present mode, of exposing ships to the wet and dry —how long would she then last? Eight or ten years, at farthest, and if her existence is to be prolonged after that period, it must be by fresh caulking, fresh painting, fresh paying, and patching throughout.

Actuated by the purest motive,—that of serving his country, the writer has, now, completed his enquiry into the chief causes of premature decay in our ships, and his examination of the means, best calculated to render them stronger, more lasting, and, consequently, more effectual instruments of advantage to our naval service. In doing this, it is very probable, as he has remarked before, that his ideas and plans will be regarded with envy, by some, who think well of no scheme, however advantageous, that is not projected by themselves, and considered theoretical by others, who are sceptical on all points that tend, either directly or indirectly, to occasion innovations, whether they are desirable or not, in established systems. But, the writer must repeat, that he has nothing to *fear* from misconstruction. He has not launched out into a boundless sea of speculative opinions, to bewilder himself and readers, in a maze of plans, without use or without explanation: but every thing he has said, is founded on the *terra firma* of facts,—incontrovertible facts, ascertained during a long course of daily, he may almost say, hourly observation of every particular. Nay, he will say more—he will be ready to *prove*, at any time, whenever called on, to the kingdom at large, that the benefits of the plans he has proposed for building, fastening, and seasoning our ships, will correspond, to the fullest extent, with his expectations.

To impress the important *truths* contained in this pamphlet still more strongly than he may have, already, done, on the public mind, he will, briefly, recapitulate and compress them together in one view. Let all our ships be framed, planked, and caulked in the dry—let them be fastened with copper,* instead of treenails or iron, the latter of which should be, completely, abolished—let a screw be employed to heave up the bolts instead of a clench—let the ships be built under cover, and remain so to season—let foreign timber (fir excepted) be, entirely, expelled from our dock-yards, unless it be of a quality equal, or nearly equal, to English oak—let no caulking iron be permitted to approach any part of a ship, till she is in a proper state for launching—and the writer has every reason to believe, that our men of war would not only last three times as long as they now do, but that they would be better able to combat the dangers to which they are exposed; that millions of money would be thereby gained to the nation; that thousands of lives would be saved; that one third of the timber now used would be sufficient; and that, by no other means, can our wooden walls be rendered so durable as the country has a right to expect, from the trouble and expense incurred in building them.

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* The writer hopes to see the day, and that not a very distant one, when the use of copper fastenings will extend, generally, to our *merchant vessels*, as well as to our ships of war.

These, it must be confessed by all, are objects of no trivial importance to a kingdom that possesses the empire of the seas, and, if they can and may be effected, they, most assuredly, have imperious and irresistible claims on the immediate attention of government. The writer has observed, with much pleasure, the attention paid, of late, to useful plans, suggested by various meritorious individuals, for the good of the navy; and when he looks round and sees how admirably the tactics of that navy are conducted, (and every Englishman must do this with an innate glow of national exultation) he cherishes the hope that, ere long, when his plans may have been carried into general practice, the mechanics of the navy will attain a similar degree of proud perfection. Let the latter only be put on an equality with the former, in the manner he has conceived it to be his duty to recommend, and it will never be requisite, a second time, to *enquire* into the *causes* of premature decay in our shipping, or to *investigate* the *means*, best calculated to prolong their duration: for the causes that, now, form the subjects of complaint, will have, then, completely, vanished; and the means, now sought to be obtained, will be so effectually realized, by the execution of his plans, as to render all ulterior measures, totally, unnecessary.

The writer, nevertheless, is, fully, aware, how tardy the measures of government are, always, obliged to be, in effecting any extensive plan of operations for the public good, (particularly when those operations, directly, militate against commonly received opinions, and long established practices) from the necessity it labours under of consulting and arranging with various departments; and he is also sensible how difficult it is to obtain a hearing, even where the true interests of the country are at stake, without having some powerful or commanding authority to support the plan proposed. But, he conceives that the contents of this pamphlet are, sufficiently, strong of themselves, without requiring the aid of any patron, that they cannot fail to excite the most serious notice of the kingdom at large, and that, when noticed, conviction must arise, and execution will follow, like cause and effect.

FINIS

L. CONGDON, PRINTER.

ERRATA.

Page 6, line 8 from top, *add* " mere capacity to" *between* the and labour.

Page 43, line 11 from top, *read* creates, *instead* of create.

Page 49, line 2 from bottom, *read* four, *instead* of five.

Page 57, line 8 from bottom, *dele* comma *between* brought and to.